

Guidance for Developing a Ground Water Quality Monitoring Program for Managed Recharge Projects by Land Application



Idaho Department of Environmental Quality

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Executive Summary

Managed (artificial) recharge, which is the management of water specifically for the purpose of adding water to the zone of saturation by land application may be one of several solutions to restore declining water levels in some aquifers.

In other western states, managed recharge has been used as a permitted program to facilitate increased water storage in aquifers without adverse impacts to ground water quality. The Idaho Department of Environmental Quality (DEQ) is therefore proactively providing this guidance document to assist interested parties in developing an appropriate ground water quality monitoring plan for DEQ review.

Purpose: Managed Recharge by Land Application

This guidance defines a process for demonstrating that a land application recharge project will not adversely affect a beneficial use of waters of the state. Included in the guidance is a description of those conditions that DEQ will consider in approving a ground water quality monitoring program for a recharge project.

This guidance does not apply to incidental recharge resulting from precipitation; irrigation practices and delivery system leakage; surface water seepage from creeks, streams, or lakes; lagoons; storm water runoff and storage; lagoons associated with confined animal operations; mining operations; wastewater land applications; or recharge water applied through the use of injection wells. If the source of recharge water is treated wastewater, including Class A effluent, then the project is subject to the *Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater* (IDAPA 58.01.17).

Authority and Rules that Apply to This Guidance

Authorities for this guidance are defined in the *Ground Water Quality Protection Act* (Idaho Code §39-120(1)), the *Ground Water Quality Plan* (Idaho Code §§39-122 through 124(1989)), *Wastewater Rules* (IDAPA 58.01.16), and the *Ground Water Quality Rule* (IDAPA 58.01.11):

- The *Ground Water Quality Protection Act* designates DEQ as the primary agency to coordinate and administer ground water quality protection programs for the state.
- The *Ground Water Quality Plan* directs DEQ, in cooperation with other appropriate agencies, to develop guidelines, management practices, and rules pertaining to ground water recharge projects.
- The *Water Quality Standards and Wastewater Treatment Requirements* or pending *Wastewater Rules* and the *Ground Water Quality Rule* authorize DEQ to approve ground water quality monitoring programs for aquifer recharge projects by land application.

Specific rules DEQ will consider when reviewing a ground water quality program for a recharge project include the following:

- *Wastewater Rules* (IDAPA 58.01.16.600), including *Applied Waters Restricted to Premises* (IDAPA 58.01.16.600.02), *Monitoring* (IDAPA 58.01.16.600.04), and *Basis for Evaluation* (IDAPA 58.01.16.600.05).
- *Ground Water Quality Rule* (IDAPA 58.01.11), including *Management of Activities with the Potential to Degrade Aquifers* (Section 301) and *Ground Water Contamination* (Section 400).

Process Overview

The process defined by this guidance includes the following actions:

- *Pre-project Meeting*. The responsible party interested in conducting a recharge project contacts the appropriate DEQ Regional Office to set up a pre-project consultation.
- *Program Submittal*. The responsible party submits a Recharge Ground Water Monitoring Program to DEQ.
- *Public Notice*. DEQ provides public notice to private property owners within the potential zone of influence of the recharge project.
- *Public Comment*. DEQ considers public comments during review of the recharge project.
- *Opportunity for Appeal*. Opportunity is provided for appeal of DEQ decisions.
- *Reporting*. The responsible party provides DEQ with a schedule for reporting monitoring results.
- *Annual Project Review*. DEQ, with the Idaho Department of Water Resources, reviews the project data. In the event that water quality is degraded, additional monitoring, modification of practices, or cessation of activity may be required.

Contents of a Ground Water Monitoring Program

A program for monitoring ground water quality for recharge by land application should address the following:

- *Project Description*, including legal and physical description of the recharge basin, land ownership, intended purpose, and outcome of recharge, and a mailing list of adjacent property owners.
- *Recharge Area Characterization*, including soil and surficial geology; hydrogeologic and surface water features; contaminant sources, land use, and vegetation; and those measures used to confine recharge water to the recharge site.

- *Evaluation of Potential Impacts* to determine if the project will reduce the quality of ground water or surface water, cause an exceedance of a ground water quality standard, or adversely affect drinking water or other uses of ground water or surface water.
- *Water Quality Monitoring Program*, including minimum requirements for monitoring, ambient ground water quality data, locations to sample and monitor, monitoring frequency, field parameters, constituents for laboratory analyses, and best management practices to maintain or improve existing ground water quality.
- *Management Practices*, including reporting schedules, contingency planning, and description of treatment processes.

Monitoring Program Approval

Approved ground water quality monitoring programs for land application recharge projects will include appropriate sampling, frequency, and reporting. Failure to comply with the approved monitoring program could subject the project to an enforcement action.

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1.0 Purpose

The purpose of this guidance is to define a process that can be used by responsible parties of recharge projects to demonstrate that a project will not adversely affect a beneficial use of waters of the state. This guidance provides details of the conditions that DEQ will use to approve a ground water quality monitoring program for a recharge project. This guidance does not apply to incidental recharge resulting from precipitation; irrigation practices and delivery system leakage; surface water seepage from creeks, streams, or lakes; lagoons; storm water runoff and storage; lagoons associated with confined animal operations; mining operations; wastewater land applications; or recharge water applied through the use of injection wells. If the source of recharge water is treated wastewater, including Class A effluent, then the project is subject to the *Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater* (IDAPA 58.01.17).

As used within this guidance, a *responsible party* can be an individual, group, corporation or other entity that is to be held accountable for implementation of the approved ground water quality monitoring plan. The responsible party, who may be the landowner, the operator, the project manager, or the benefactor, should be identified in the monitoring plan.

2.0 Introduction

An increased demand for groundwater, coupled with decreased precipitation, has resulted in declining water levels in some areas of Idaho. Managed (artificial) recharge, which is the management of water specifically for the purpose of adding water to the zone of saturation by land application may be one of several solutions to restore declining water levels in some aquifers.

Managed recharge does not include incidental recharge by precipitation; irrigation practices and conveyance system leakage; surface water seepage from creeks, streams or lakes, lagoons; storm water runoff and storage; lagoons associated with confined animal operations; mining operations; wastewater land applications; or recharge water applied through the use of injection wells.

In other western states, managed recharge has been used as a permitted program to facilitate increased water storage in aquifers without adverse impacts to ground water quality. The Idaho Department of Environmental Quality (DEQ) is therefore proactively providing this guidance document to assist interested parties in developing an appropriate ground water quality monitoring plan that DEQ reviews.

Because recharge projects have the potential to impact ground and surface waters, they must comply with state policy, such as the *Ground Water Quality Protection Act* (Idaho Code §39-120(1)) and the *Idaho Ground Water Quality Plan* (Idaho Code §39-122

through 124(1989)). This guidance document will assist the responsible party wanting to comply with the legislative mandates and Department of Environmental Quality (DEQ) rules. Specific guidance is included for the following:

- The *Statement of Authority* (Section 3.0) generally describes the statutes and rules that apply to recharge projects.
- *Applicable DEQ Rules* (Section 4.0) outlines specific DEQ rules that apply to recharge projects.
- The *Process Overview* (Section 5.0) section lists the steps necessary to receive DEQ approval of a ground water monitoring program for an aquifer recharge project.
- Section 6.0, *Contents of a Ground Water Monitoring Program*, provides the responsible party with information necessary to develop ground water quality monitoring programs.

3.0 Statement of Authority

Authority for this guidance is defined in the following.

3.1 Ground Water Quality Protection Act

The *Ground Water Quality Protection Act* (“Act”) (Idaho Code §39-102(3) (a)) states that “it is the policy of the state to prevent contamination of ground water from any source to the maximum extent practical” and (Idaho Code §39-102(3) (c)) states “all persons in the state should conduct their activities so as to prevent the nonregulated release of contaminants into the ground water.” The *Ground Water Quality Protection Act* (Idaho Code §39-120(1)) designates DEQ as the primary agency to coordinate and administer ground water quality protection programs for the state (<http://www3.state.id.us/cgi-bin/newidst?sctid=390010020.K>).

3.2 Ground Water Quality Plan

The *Ground Water Quality Protection Act* provides for the development of a *Ground Water Quality Plan* (“Plan”) to be submitted to and approved by the Idaho legislature (Idaho Code §39-122 through 124(1989)). The Plan was adopted by the fifty-first legislature in the second regular session (1992, ch.310 §1).

Ground Water Protection Policy I-B of the Plan states: “the policy of the state of Idaho is that existing and projected future beneficial uses of ground water shall be maintained and protected, and degradation that would impair existing and projected future beneficial uses of ground water and interconnected surface water shall not be allowed.” In part, the intent of Ground Water Protection Policy I-B is to “ensure that the

quality of ground water that discharges to surface water does not impair identified beneficial uses of the surface water.”

Ground Water Quality Monitoring Policy V-C of the Plan states: “the policy of the state of Idaho is that any program designed specifically for the artificial recharge of ground water, existing or proposed, be consistent with the policies and management objectives for water quality and quantity.” In part, this policy was adopted because “artificial recharge has the potential to significantly impact the quality of ground water.” This section of the *Ground Water Quality Plan* directs DEQ, in cooperation with other appropriate agencies, to develop guidelines, management practices, and rules to ensure that artificial ground water recharge projects comply with the *Ground Water Quality Plan* (1992).

3.3 Wastewater Rules (IDAPA 58.01.16)

In the *Wastewater Rules* (IDAPA 58.01.16), Section 600 applies to *Land application of Wastewater(s) or Recharge Waters*. IDAPA 58.01.11, the *Ground Water Quality Rule*, authorizes DEQ to approve ground water quality monitoring programs for aquifer recharge projects by land application. These rules can be viewed at the following Web site:

<http://www2.state.id.us/adm/adminrules/rules/idapa58/58index.htm>

DEQ is aware of the widespread social and economic considerations of recharge projects and recognizes the importance of these projects to help minimize ground water depletions. DEQ has an obligation to review monitoring programs for recharge projects, to ensure that ground water will not be degraded and that negative impacts will not occur to a beneficial use of ground or surface water. DEQ may also review the recharge project method of application, site-specific conditions, and source of recharge water to ensure compliance with the *Ground Water Quality Rule* and *Water Quality Standards*.

4.0 Applicable DEQ Rules

This section describes the specific rules DEQ will consider when reviewing a ground water quality monitoring program for a recharge project. As set out below, a ground water quality monitoring program must be developed for recharge projects, and the monitoring program is subject to DEQ approval. In addition, DEQ rules contain provisions to ensure protection of ground water quality. To help ensure that the project is consistent with ground water quality rules, DEQ may also provide comments regarding the ground water recharge project.

4.1 Wastewater Rules (IDAPA 58.01.16)

This section lists the applicable portions of 58.01.16, Section 600, *Land Application of Wastewater(s) or Recharge Water*.

4.1.1 Applied Waters Restricted To Premises (IDAPA 58.01.16.600.02)

“... recharge waters applied to the land surface must be restricted to the premises of the application site unless permission has been obtained from the Department authorizing a discharge into the waters of the state.”

All recharge programs will need written documentation from the landowner(s), approving and requesting authorization to conduct a recharge project.

4.1.2 Monitoring (IDAPA 58.01.16.600.04)

“Provisions must be made for monitoring the quality of the ground water in proximity of the application (recharge) site. The ground water monitoring program is subject to approval by the Department. All data and reports resulting from the ground water monitoring program must be submitted to the Department upon request.”

The frequency and parameters to be monitored is dependent upon the nature and volume of recharge water; the frequency and duration of application, and the characteristics of the soil mantle and lithology underlying the recharge site.

4.1.3 Basis for Evaluation (IDAPA 58.01.16.600.05)

“The evaluation for an approval to irrigate, either by sprinkling or flooding or surface spreading of wastewater material or by burying wastewater material or recharge water in the upper soil horizon as a method of treatment, must include, but will not necessarily be limited to, consideration of the following items:

- a. . . . Other wastewater(s) or recharge waters will be considered provided it can be shown that land application will not adversely affect current or future beneficial uses of waters of the state.
- b. The nature of the soils and geologic formations underlying the application site. The entity proposing the activity must provide reasonable assurance that the soils and site geology will provide the required level of treatment and will not allow movement of pollutants into the underlying ground water.
- c. The ability of the soil and vegetative cover on the application site to remove the pollutants contained in the applied waters through the combined processes of consumptive use and biological and chemical inactivation.”

4.2 Ground Water Quality Rule (IDAPA 58.01.11)

This section lists the applicable portions of the *Ground Water Quality Rule*. Aquifers in Idaho are split into three classifications: *Sensitive Resource*, *General Resource*, and *Other Resource*. Each classification requires slightly different management strategies.

The Spokane Valley – Rathdrum Prairie aquifer is the only aquifer in Idaho that is classified as a *Sensitive Resource* aquifer. All other aquifers in the state are categorized as *General Resource* aquifers. There are no aquifers classified as *Other Resource*, and this classification is not discussed in this guidance.

See Section 300 of the rule for details of aquifer categorization; Section 301 describes requirements for filtration and disinfection:

4.2.1 Management of Activities with the Potential to Degrade Aquifers (IDAPA 58.01.11.301.01)

“01. Sensitive Resource Category Aquifers.

- a. Activities with the potential to degrade Sensitive Resource aquifers shall be managed in a manner which maintains or improves existing ground water quality through the use of best management practices and best available methods. [Underlining added for emphasis].
- b. Numerical and narrative standards identified in Section 200 shall apply to aquifers or portions of aquifers categorized as Sensitive Resource. In addition, stricter numerical and narrative standards, for specified constituents, may be adopted pursuant to Section 350 on a case by case basis and listed in Section 300.

02. General Resource Category Aquifers.

- a. Activities with the potential to degrade General Resource aquifers shall be managed in a manner which maintains or improves existing ground water quality through the use of best management practices and best practical methods to the maximum extent practical [Underlining added for emphasis].
- b. Numerical and narrative standards identified in Section 200 shall apply to aquifers or portions of aquifers categorized as General Resource.”

4.2.2 Ground Water Contamination (IDAPA 58.01.11.400)

“01. Releases Degrading Ground Water Quality. No person shall cause or allow the release, spilling, leaking, emission, discharge, escape, leaching, or disposal of a contaminant into the environment in a manner that:

- a. Causes a ground water quality standard to be exceeded;
- b. Injures a beneficial use of ground water; or
- c. Is not in accordance with a permit, consent order or applicable best management practice, best available method or best practical method.

02. Prevention Measures.

- a. When a numerical standard is not exceeded, but degradation of ground water quality is detected and deemed significant by the Department, the Department shall take one (1) or more of the following actions:
 - i. Require a modification of regulated activities to prevent continued degradation;
 - ii. Coordinate with the appropriate agencies and responsible persons to develop and implement prevention measures for activities not regulated by the Department;
 - iii. Allow limited degradation of ground water quality for the constituents identified in Subsections 200.01.a. and 200.01.c. if it can be demonstrated that:
 - (1) Best management practices, best available methods or best practical methods, as appropriate for the aquifer category, are being applied [Underlining added for emphasis]; and
 - (2) The degradation is justifiable based on necessary and widespread social and economic considerations; or
 - iv. Allow degradation of ground water quality up to the standards in Subsection 200.01.b. if it can be demonstrated that:
 - (1) Best management practices are being applied; and
 - (2) The degradation will not adversely impact a beneficial use.
- b. The following criteria shall be considered when determining the significance of degradation:
 - i. Site-specific hydrogeologic conditions;
 - ii. Water quality, including seasonal variations;
 - iii. Existing and projected future beneficial uses;
 - iv. Related public health issues; and
 - v. Whether the degradation involves a primary or secondary constituent in Section 200.

03. Contamination Exceeding A Ground Water Quality Standard. The discovery of any contamination exceeding a ground water standard that poses a threat to existing or projected future beneficial uses of ground water shall require appropriate actions, as determined by the Department, to prevent further contamination. These actions may consist of investigation and evaluation, or enforcement actions if necessary to stop further contamination or clean up existing contamination, as required under the Environmental Protection and Health Act, Section 39-108, Idaho Code.”

5.0 Process Overview

The following provides an overview of the process to receive DEQ approval of a ground water quality monitoring program for a recharge project.

5.1 Pre-project Planning Meeting

It is recommended that the responsible party interested in conducting a recharge project contact the DEQ Regional Office to set up a pre-project consultation meeting.

5.2 Develop and Submit a Recharge Ground Water Monitoring Program

Responsible parties interested in conducting a recharge project will provide, to the appropriate DEQ Regional Office, three (3) written copies and one (1) electronic version of the submitted materials. The major components of the recharge ground water quality monitoring program include the following:

1. Project Description
2. Recharge Area Characterization
3. Evaluation of Potential Impacts
4. Water Quality Monitoring Program
5. Management Practices

5.3 Public notice

DEQ may provide public notice to all potentially impacted property owners within the potential zone of influence. The zone of influence, protective of human health, is considered to include a one-year time of travel distance based on conservatively estimated pathogen survival rates. Notification may be by certified mail, return receipt requested.

The notification should inform the public of the potential risks associated with recharging ground water with surface water and should include an opportunity to submit comments to the DEQ Regional Office. The comment period will extend for 30 days following the posting of the notice regarding the recharge project on the DEQ Web site. All public comments shall be considered during the DEQ review period.

5.4 Assurance of Protection of Beneficial Uses

The responsible party for the project should provide assurance that a current or future beneficial use of the waters of the state will not be adversely affected by recharge projects. The physical characteristics of the site, the existing ground water quality, and the water quality of the recharge water for the project must be appropriate to protect

ground water quality. Potential changes in water quality resulting from the introduction of recharge water into an aquifer by infiltration must be identified.

5.5 Case-by-Case Consideration of Recharge Projects

Due to the variability in site characteristics within Idaho, each project will be considered on a case-by-case basis.

5.6 Desired Qualifications for Developers of Recharge Projects

It is suggested that recharge projects be developed by a qualified party with experience in subsurface resource evaluation practices. Qualified parties are typically environmental consultants with backgrounds in geology, hydrogeology, soil science, and geochemistry or related engineering disciplines. The soil, geology, and hydrologic conditions of both the recharge site and the affected subsurface area, along with the quality of the recharge water and ground water, will determine the level of detail necessary for the recharge project program.

5.7 DEQ review period

The DEQ Regional Office will consider public comment and the submitted materials in making its decision. DEQ will review the recharge project and respond within a reasonable timeframe, which DEQ generally anticipates to be 30 days from the end of the public comment period.

The DEQ Regional Office will issue a letter that may approve, disapprove, or approve with conditions the ground water monitoring program for a recharge project. DEQ may also provide comments regarding the method of application in order to help ensure the project is consistent with DEQ's ground water quality protection rules. DEQ does not anticipate issuing a wastewater land application permit for a recharge project.

5.8 Opportunity for Appeal

Idaho Code § 39-107 and the *Rules of Administrative Procedure Before the Board of Environmental Quality* (IDAPA 58.01.23) provide that any person aggrieved by an action or inaction of DEQ may initiate a Contested Case by filing a Petition for a Contested Case with the Board of Environmental Quality within 35 days of the action or inaction of DEQ. Persons aggrieved by DEQ's action with respect to water recharge projects may be entitled to initiate such a Contested Case.

5.9 Reporting

The responsible party should provide a reporting schedule for monitoring results, an annual report, and an expedited report when monitoring results meet or exceed an alert

level (see Section 6.4.8). If an alert level is reached, the DEQ Regional Office must be notified within 24 hours of receipt of laboratory results.

Routine water quality reports with field parameter sheets will be submitted to the DEQ Regional Office within 10 days of receipt of laboratory results. However, the frequency for reporting of monitoring results (within 10 days of receipt) may be reduced following review of an annual report.

An annual report is to be submitted to the DEQ Regional Office by January 30 of each calendar year. The annual report will outline the previous years recharge activities, including a summary of all water quality monitoring results and recorded hydrogeologic changes.

5.10 Annual Project Review

The DEQ Regional office will consult with the Idaho Department of Water Resources (IDWR) for review of all routine water quality reports and the annual report. Based on the results of this consultation, modifications to the project may be necessary.

For example, in the event ground water quality is degraded by recharge water, DEQ may require additional monitoring, modification of recharge practices, or cessation of the activity. Additional monitoring may include increased frequency of sampling events at selected existing wells and/or installation of new monitoring wells. The use of best management practices or best practical methods may be required as modifications to the recharge activity.

On the other hand, if ground water quality shows no indication of degradation, monitoring requirements may be decreased. It should be recognized that recharge water may be of higher quality than existing ground water for some constituents in some areas.

6.0 Contents of a Ground Water Quality Monitoring Program

Approval of a ground water quality monitoring program for recharge by land application will be considered, on a case-by-case basis, based on the information submitted in the program. Ground water quality monitoring program plans must be submitted to DEQ Regional Offices by the responsible party proposing to conduct a recharge project. The responsible party (see Section 1.0 for a definition of this term) must be identified in the monitoring plan.

Recharge projects may be designed to either offset ground water depletions or augment stream and spring flows, and the contents of a recharge ground water monitoring program should include the elements defined in Section 5.2; recommended content for each of these elements is described in the following.

6.1 Project Description

The ground water quality monitoring program should provide a legal description of the recharge basin, a physical description of the basin, a statement of land ownership, a statement of the intended purpose of the recharge activity and the expected outcome, and a mailing list of adjacent property owners. The project description should also include the source, diversion location, and type of water used for recharge, the expected volume of water, project duration, project delivery system, and a general site map.

6.2 Recharge Area Characterization

The area to be characterized for the recharge project will include the basin site and all down-gradient areas that could be affected by the project. Down-gradient areas encompass the one-year time of travel distance as described in Section 6.2.2.b.

The characterization should include information on the recharge area soils, geology, hydrogeology, potential contaminant sources, land use, vegetation, and surface water features. Maps to be included as a part of the recharge area characterization should consist of the following:

1. Soils/Surficial Geologic Map
2. Hydrogeologic and Surface Water Feature Map
3. Contaminant Source/Land Use/Vegetation Map

6.2.1 Soil and Surficial Geology - Map and Description

A soils map and a geologic map of the area must be included. These maps should provide the information described in the following.

6.2.1.a. Soils Information

The soil types must be identified by thickness, organic matter content, textural class, bulk density, permeability, available water holding capacity, and cation exchange capacity for each soil type. The Natural Resources Conservation Service (NRCS) and the Soil Conservation Commission (SCC) may provide useful soil information.

The soils should act as a filtration system that can remove microbial organisms or act as a sorption material for attenuating chemical contaminants of the recharge water. In general, a minimum soil thickness for filtration is two feet, but the actual thickness required will be dependent on the soil type.

Test pits or borings may be required to adequately determine soil types and thicknesses in areas with limited existing data; the test pit and boring locations, along with the areal extent of the soils must be shown on the map.

Soil hydraulic conductivity or infiltration rate must be determined to demonstrate that the site has the capacity for recharge and is feasible for recharge. It is suggested the recharge capacity be determined prior to developing a ground water quality monitoring program.

In areas without adequate soil cover, and where the soils are proposed for importation to augment the soil cover at the site, it is strongly recommended to present the proposal to

DEQ prior to importing soils. Specific details regarding requirements for such sites will be determined on a case-by-case basis.

6.2.1.b. Geologic Information

Geologic features to be identified include lithology, outcrops, faults, fractures, and joint patterns. Exposed rock outcrops, fractures, or faulting zones could act as direct conduits for the recharge water to enter the ground water without the benefit of filtration.

6.2.2 Hydrogeologic and Surface Water Features - Map and Description

A hydrologic map must be provided that includes the location of springs, wells, hydrogeologic boundaries, and surface water features, including canals and diversion structures. The configuration of the recharge basin must be put on this map, along with the delivery system of the recharge water. In cases of considerable transport distance, a description may be appropriate.

6.2.2.a. Vadose Zone Characterization

The vadose zone is considered to be the unsaturated material between the land surface and the water table. A description of the vadose zone must be provided that includes the thickness, lithologic characteristics, and hydraulic properties (such as hydraulic conductivity in the vertical and horizontal directions).

6.2.2.b. Aquifer Characterization

An aquifer is a geological unit of permeable saturated material capable of yielding economically significant quantities of water to wells or springs. A description of the aquifer(s) that will be affected by the recharge activity should include the areal extent, thickness, hydraulic conductivity, boundary conditions, hydraulic gradient, ground water flow direction (regional and local), storage potential, and natural ground water flow velocity.

In the case of a multiple-aquifer system, the parameters for that portion(s) of the system that will be affected by the recharge activity must be described. A description of the extent, porosity, and thickness of any confining layers should also be provided.

A description of potential impacts that could affect a beneficial use of ground water within the aquifer system must be provided. The anticipated changes in the direction of ground water flow and a description of subsurface geology, including any potential perching units that may intercept the recharging water or impede recharge, must be provided.

To provide the aquifer characteristics described above, and to determine the availability of existing wells that may serve as sampling sites for the monitoring program, an inventory of up and down-gradient wells is recommended. IDWR maintains a Web site that supports searching for well logs:

<http://www.idwr.state.id.us/water/well/search.htm>

Microfiche of well logs are also available at the IDWR state or regional offices. Copies of well logs within the area must be provided and located on the hydrologic map.

Well logs can provide depth to water, specific capacity estimates, lithologic descriptions of the subsurface, and well construction details. By locating wells on a topographic map, generalized elevations can be determined for the top of casing, water table, and lithologic zones.

Hydraulic conductivity and porosity can be determined from published values for the respective lithology. Ideally, hydraulic conductivity should be determined on a site-specific basis through the use of appropriately designed and conducted aquifer tests.

The down-gradient wells should encompass a one-year time of travel and should include the nearest down-gradient receptor to evaluate potential impacts. The one-year time of travel criteria is based on the estimated ground water flow velocity at the site and the potential for transportation and die-off of pathogens in the subsurface. The travel time estimate can be calculated from measured or estimated values of the hydraulic conductivity, hydraulic gradient, and porosity.

The up-gradient wells should be located within a one-mile distance up-gradient from the site.

Other resources for hydrogeologic information include published hydrogeologic investigations conducted in the area by various agencies, such as DEQ, IDWR, the United States Geological Survey (USGS), Idaho Department of Agriculture (ISDA), and the Idaho Water Resource Research Institute (IWRRI).

6.2.2.c. Springs Description

Springs can be located from a site survey, maps, and remote sensing images. Springs within the one-year time of travel must be noted on the hydrogeologic map. A description of each spring should include the discharge rate and any other pertinent information. Springs may serve as potential sampling sites for the monitoring program (See Section 6.2.2.b).

6.2.2.d. Surface Water Description

Streams (including intermittent), rivers, canals, and ditches must be located on the hydrogeologic map. All structures, diversions, and features associated with recharge operations should also be located on the map.

If the recharge site is within a 100-year flood plain, that information must be provided. Federal Emergency Management Agency (FEMA) maps delineate 100-year flood plain areas and are available at the following Web site:

<http://www.fema.gov/fhm/>

The 100-year flood plain designations may also be available at county offices. If the recharge site is in an area with a high potential to flood, recharge related structures—including soil cover—have the potential to be washed out.

6.2.3 Contaminant Sources, Land Use, and Vegetation - Map and Description

A land use map must be provided that includes the locations of potential contaminant sources, known sources or contaminant plumes, land use structures (such as buildings, roads, etc.), and land use areas, including vegetation type (such as irrigated agriculture, dry agriculture, urban, etc.). County land use maps, tax code maps, or comprehensive plans may be a resource.

6.2.3.a. Identifying Contaminant Sources Within the Immediate Recharge Site

Potential and known contaminant sources can be determined from site surveys, local knowledge, and GIS coverages. Source Water Assessments for local public water supply wells may be another resource to identify potential contaminant sources and are available at the local DEQ Regional Office or from the following Web site:

<http://www.deq.state.id.us/water/SWARReports/InternetQuery.cfm>

Potential contaminant sources may include cemeteries; septic systems; sand, gravel or mineral extraction operations; wastewater treatment facilities; industries; active agricultural land; dairies or other confined animal feeding operations; landfills; underground storage tanks; *Resource Conservation Recovery Act* (RCRA) sites; and *Comprehensive Environmental Response Compensation Liability Act* (CERCLA) sites.

6.2.3.b. Land Use Description

Past, present, and projected future land use and related structures at the site must be described. For example, if the site is currently used, or has been used, for a landfill or feedlot, land use related residual contaminants might exist in the area. Information on such contaminants can be obtained from local knowledge, GIS coverages, and a site survey.

Previous ownership records can provide historic land use activities and can be obtained from the local county assessor's office. County offices may be able to provide information regarding projected future land use. If land use changes occur during the recharge project, the responsible party may be required to change the sampling program or recharge process.

Public land ownership should also be shown on the map.

6.2.3.c. Vegetative Cover Description

The type and distribution of vegetation within the recharge area should be identified. If vegetation is undisturbed, a description of the consumptive use that includes the plant uptake properties should be provided for each species. If vegetation is removed, the removal and yearly maintenance in the basin should be described.

6.2.4 Confining Recharge Water to the Recharge Site

Prior to infiltration, the recharge water must be restricted to the premises of the application site (See IDAPA 58.01.16.600.02). Any structural controls or berms required

to achieve containment of the recharge water within the recharge site must be shown on the land use map.

6.3 Recharge Project Evaluation and Other Considerations

The responsible party must evaluate the project to determine consistency with the rules set out in Section 4.0. In general, this means the responsible party should evaluate the project to determine whether the project will result in any of the following:

- Lowering the current quality of ground or surface water
- Exceeding any ground water quality standard as set forth in the *Ground Water Quality Rule*
- Adversely affecting drinking water or other uses of ground or surface water

The responsible party should also evaluate the project to ensure it does not create any health risks, safety risks, or nuisance conditions.

Responsible parties for recharge projects need to consider those aspects of the recharge activity that may have the potential to affect the health and safety of the public or create nuisance conditions.

All insect and weed control chemicals that may be used in the recharge basin or in the delivery system must be identified with anticipated recharge rates, amounts of recharge, and the preventative measures to be taken to avoid contamination of the recharge water.

Preventive measures, such as fencing designed to prevent animals from entering the recharge basin may be necessary. For safety reasons, signs to notify the public of the recharge practice and the sensitivity of the area may be necessary.

6.4 Ground Water Quality Monitoring Program and Sample Location Map

The purpose of a ground water quality monitoring program is to determine the effects of introducing recharge water into the ground water. Several site-specific factors, including site hydrogeology, filtration medium properties, ground water quality of the site, proximity of domestic wells, and recharge water quality, will determine the level of detail necessary for the water quality monitoring program.

6.4.1 Level of Detail

The level of detail, or minimum requirements, for each monitoring program will be determined by site-specific hydrogeologic factors.

If the recharge water is of higher quality than ground water at the site, or if the basin has high filtration potential, some monitoring requirements and/or parameters for the project may be waived. The responsible party should provide a ground water quality monitoring program that adequately ensures protection of ground water quality, and a location map with sample sites must be included.

The ground water quality monitoring program needs to evaluate potential changes in water quality and water levels resulting from the introduction of recharge water into the aquifer by land application. The program should include a description of equipment used to obtain field parameters, sampling procedures, holding times, and a description of the quality control and quality assurance measures that will be followed. The location of water quality monitoring sampling sites should include the ground water, springs, and recharge water locations and must be depicted on the map.

6.4.2 Ambient or Baseline Ground Water Quality

The responsible party should provide ambient or baseline ground water quality data as part of the monitoring program. The number of samples necessary to determine baseline conditions will be determined on a case-by-case basis and will be discussed during the recommended pre-project planning meeting (see Section 5.1).

The results of the baseline ground water quality monitoring will be used to determine the parameters and frequency for water quality monitoring during and after recharge.

Additional baseline ground water quality information may be available from the IDWR *Statewide Monitoring Network*, the USGS, ISDA, or DEQ. Monitoring for one year prior to recharge is recommended to determine pre-existing water quality.

Baseline levels for pathogens will be considered to be zero unless shown otherwise.

6.4.3 Ground Water Monitoring Location

From the inventory of wells and springs (see Section 6.2.2.b, *Aquifer System Characterization*), the responsible party should suggest locations to sample and monitor ground water quality. Sites must be selected based on their location with respect to ground water flow, well construction details, spring discharge, and access to the sample locations.

The location and number of existing wells and springs will determine the need for the installation of new monitoring wells necessary to evaluate ground water quality. Determining the need to install additional monitoring wells will be done on a case-by-case basis. Locations for ground water sampling should be located up-gradient, down-gradient, and should be shown on the water quality sampling configuration map.

6.4.4 Recharge Water Quality and Monitoring Location

The responsible party should provide baseline or ambient recharge water quality data as part of the monitoring program. This information may be available from the USGS *Idaho Surface Water Quality Statewide Network*, the U.S. Bureau of Reclamation (USBR) *National Irrigation Water Quality Program* (NIWQP), the Army Corps of Engineers (USACE), the Environmental Protection Agency (EPA), and the ISDA *Agricultural Surface Water Quality Program*.

The locations for sampling the recharge water must be shown on the sampling configuration map, and the water quality of the recharge water must be evaluated to determine that ground water will not be degraded by the introduction of the recharge

water. The source of the recharge water, the timing, and the volume of water to be recharged should also be described.

6.4.5 Water Quality Monitoring – Frequency

The responsible party should provide a proposed frequency for water quality monitoring as part of the monitoring program. The elements to consider when developing a monitoring schedule are the ground water flow system, the availability and quality of the recharge water, and the duration of recharge.

Generally, ground water monitoring should occur prior to recharge, during recharge and after recharge. The recharge water must be monitored prior to and during recharge.

The monitoring frequency will need to be increased for locations that pose a higher risk of transporting contaminants to the ground water.

6.4.6 Water Quality Monitoring – Field Parameters

The responsible party should provide a proposed list of field parameters for water quality monitoring as part of the monitoring program. Field measurements should include static water level measurements in all wells. When monitoring wells, springs, and recharge water, field measurements should include the following:

- Water temperature
- Specific Conductance/Total Dissolved Solids
- Dissolved Oxygen
- pH

6.4.7 Water Quality Monitoring – Field Scan and/or Laboratory Analyses

The responsible party should provide a proposed list of constituents for water quality monitoring as part of the monitoring program; laboratory analyses will be necessary to evaluate chemical and pathogenic microbiological changes in water quality. Constituents of concern are those chemical and pathogenic microbial constituents that may be related to land use along the delivery system and within the recharge area.

All recharge projects should initially monitor for major anions and cations, metals, bacteria, and nutrients, and should include an initial scan for pesticides and volatile organic chemicals. The project manager is advised to contact an EPA certified laboratory for appropriate sample containers and sampling methods. The individual constituents are described below:

- **Major Anions** – Sulfate, bicarbonate, chloride
- **Major Cations** – Calcium, sodium, potassium, magnesium
- **Metals** – Arsenic, selenium, cadmium
- **Bacteria** – Total Coliform – Fecal coliform and *E. coli*.

-
- **Nutrients** – Total Phosphorous, and Nitrate + Nitrite
 - **Pesticide Scan** - Immunoassay screening or appropriate EPA analytical method for chemicals used in the area.
 - **VOC analyses** should follow EPA methods, such as 524.2 or 502.2, or an appropriate scanning technique.

Based on land use and management practices associated with the recharge project, DEQ may add additional constituents to the list above. (See Appendix A, page 21, for a list of constituents from the *Ground Water Quality Rule*.)

The responsible party should consult with Idaho State Department of Agriculture, Division of Agricultural Resources, to determine the types of pesticides and herbicides used in the recharge area and along the delivery system of the recharge water. The responsible party should contact an EPA certified laboratory for appropriate analytical methods for the chemicals used.

DEQ may request analyses for additional constituents, such as cryptosporidium, Giardia, and viruses, such as coliphage. Analyses for Total Organic Carbon (TOC), disinfectants, and disinfectant by-products because of treatment (see Section 6.4.9), may be requested on a case-by-case basis.

TOC is used as an indicator for a range of organic compounds present in surface water. The presence or absence of organic compounds can determine the effectiveness of the filtration medium. DEQ may also request a community level physiological profiling (CLPP), which can be used to differentiate the microbial communities present in surface water from ground water.

Analytical methods for microorganisms are frequently updated. Responsible parties are encouraged to consult with the American Society for Testing and Materials (ASTM International) *Standard Methods for the Examination of Water and Wastewater*, 20th edition, 1998 (Clescerl, Greenberg, and Eaton), the American Public Health Association, and the Water Pollution Control Federation for the most recent method.

Initial analytical results, along with site-specific land use, aquifer characteristics, and potential contaminant sources may be used to determine subsequent monitoring requirements. Recognizing that, in some areas of the state, the source water to be used for recharge may be of higher quality than the ground water to be recharged, water quality monitoring and frequency may be determined on a case-by-case basis, provided that adequate background water quality data for both ground water and source water is presented.

6.4.8 Monitoring Results and Alert Levels

Recharge programs must be developed with appropriate best management practices (BMPs) to maintain or improve existing ground water quality. A monitoring *alert level*, as defined below, may be considered a “trigger” to re-evaluate or implement additional precautionary measures and prevent degradation resulting from the recharge project. When an alert level for a constituent is reached, a repeat sample must be taken for confirmation. Alert levels can be found in Appendix A, page 21.

An alert level may be considered to be one of the following:

- For volatile organics, synthetic organics, bacteria, protozoa, and viruses – a **detection** is the alert level. If fecal coliform or *E. coli* is detected, then CLPP and/or analysis for cryptosporidium, Giardia, and viruses may be required.
- For inorganics (other than nitrate), radionuclides, and some secondary or unclassified constituents – half of the Ground Water Standard is the alert level
- For nitrates, the alert level depends on whether the analytical result is *less than* or *greater than* half the value of the Ground Water Standard

If the analytical result for nitrate is *less than* half the Ground Water Standard:

- An alert level is not reached, and no action is required, if the analytical result is *less than* 25% above the background level for the area.
- An alert level is reached, and additional monitoring may be required, if the analytical result is *greater than* 25% above the background level for the area.

If the analytical result for nitrate is *greater than* half the Ground Water Standard:

- An alert level is not reached, and no action is required, if the analytical result is *less than* 10% above the background level, for the area.
- An alert level is reached, and additional monitoring may be required, if the analytical result is *greater than* 10% above the background levels for the area.

If natural background levels are above a ground water standard in the area, that natural background level may be considered to be a ground water standard for that area. (Background levels are discussed more fully in Section 6.4.2.)

If the repeat sample confirms that an alert level has been reached, a report to DEQ must be submitted and should do the following:

1. Assess why the alert level was reached, and identify potential sources.
2. Assess additional contingency actions or BMP implementation (possibly additional monitoring).

6.4.9 Recharge Water Treatment

The responsible party should provide a description of any treatment processes applied to the proposed recharge water—to minimize or eliminate contamination from entering the ground water system. Should disinfectants be used in any treatment process, the disinfectant and disinfectant byproducts should be considered as contaminants of concern and analyzed accordingly.

6.5 Management Practices

Management practices must be in place to address report scheduling, planning for contingencies, and treatment of recharge water.

6.5.1 Reporting Schedule

Important reporting commitments associated with recharge project operation include the following:

- The responsible party should provide a reporting schedule for monitoring results, the annual report, and for expedited reports when monitoring results meet or exceed an alert level.
- If an alert level is reached, the DEQ Regional Office must be notified within 24 hours of receipt of laboratory results.
- Routine laboratory analyses and field sheets for recharge and ground water quality monitoring must be submitted to the DEQ Regional Office within 10 days of receipt of laboratory results.
- An annual report for the project must be submitted to the DEQ Regional Office by January 30 of each calendar year.

The frequency of reporting may be reduced following review of an annual report. The annual report will outline the previous year of recharge activities, including a summary of all water quality monitoring results and recorded hydrogeologic changes.

6.5.2 Contingency Plan

A contingency plan must be developed and submitted, as part of the project program, to address potential emergency situations at the recharge basin and in the recharge water delivery system. Examples of emergency situations to be addressed in the contingency plan may include the following:

- Misapplication of pesticides or herbicides to either the recharge basin or the water delivery system during a period of recharge.
- An accident involving a vehicle along the delivery system.
- Aerial application of pesticides or herbicides to the recharge basin or along the delivery system.

A notification procedure and plan of action must be included in the contingency plan.

6.6 Monitoring Plan Approval

DEQ, pursuant to *Wastewater Rules, Land Application of Wastewater(s) or Recharge Waters* (IDAPA 58.01.16.600), is authorized to approve ground water quality monitoring programs for land application recharge projects. Approved monitoring programs will include appropriate sampling (number and type), frequency, and reporting. Failure to comply with the approved monitoring program is a violation of DEQ's rules and may subject the project to an enforcement action.

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